

Readily available acidity in schwertmannite

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Introduction

Schwertmannite and jarosite are considered as less soluble ironhydroxy sulfate minerals which are present in highly acidic environments (pH < 3). These minerals release acidity in the long run as they weather by hydrolysis [1]. However, 1M KCl extraction of soil samples (Clarence and Quartz) spiked with those two minerals showed that schwertmannite has some acidity that may be readily available.

Results and Discussion

Unlike jarosite, schwertmannite released acidity during 1M KCl extraction. It was found that the measured acidity in schwertmannite added samples was ~1/3 of the expected total inherent acidity (Figure 1). This acidity release was also associated with the release of surface bound sulfate from schwertmannite. It was found that ~30% of sulfate in schwertmannite was able to be released by 1M KCl, an amount that matches other observations [2].

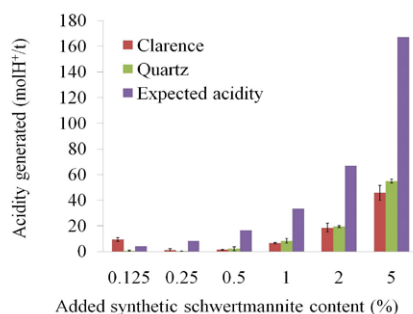


Figure 1: Acidity generated vs expected acidity

[1] Ahern *et al.* (2004) Queensland Acid Sulfate Soils Manual.

[2] Bigham *et al.* (1990) *Geochim. Cosmochim. Acta* **54**, 2743–2758.

Dust from copper smelters in the Zambian Copperbelt

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Smelting activities in the Copperbelt Province (Zambia) have produced huge amounts of various wastes. Dust particles emitted during the ore and slag processing pose high risk of environmental pollution in this area [1, 2]. Three types of dusts identified as possible sources of contamination were studied: (A1) dust from slag crushers, (A2) fly ash trapped by filters originating from processing of the slags and (B) electrostatic precipitator dust from smelting of Cu and Co-rich ores. Bulk chemical analyses and mineralogical investigation using XRD, SEM/EDS and TEM were performed. The samples were enriched with various levels of metals and metalloids. Maximum concentrations of 256 g Cu/kg (B), 8.9 g Co/kg (A1), 4.7 g Pb/kg (A2) and 19.8 g Zn/kg (A2) were determined. Based on XRD analysis, the composition of dust A1 generally corresponds to silicate slags [3] with dominating Ca-Fe pyroxenes, quartz (SiO₂), fayalite (Fe₂SiO₄) and cuprospinel (CuFe₂O₄). Calcite (CaCO₃), Ca-Fe pyroxenes and quartz represented the main phases of fly ash A2 with minor ZnS and elemental Cu and a significant portion of amorphous/glassy fraction. Chalcantite (CuSO₄·5H₂O), magnetite (Fe₃O₄) and delafossite (CuFeO₂) dominated in dust B. Detailed mineralogical investigations revealed the presence of Cu sulphides in the studied samples and possible substitutions of metals in the pyroxene structure. Elevated concentrations of Cu, Co and Zn were detected in the silicate glass. *In situ* weathering processes may result in the release of contaminants into the environment (e.g. soils) depending on the stability of phases present in the dust.

[1] Křibek *et al.* (2010) *J. Geochem. Explor.* **104**, 69–86.

[2] Pettersson & Ingri (2001) *Chem. Geol.* **177**, 399–414.

[3] Vítková *et al.* (2010) *Mineral. Mag.* **74**(4), 581–600.